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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/511,398	02/23/2000	Tomohiro Okumura	00177/530809	3756

7590 09/20/2002

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EXAMINER

PADGETT, MARIANNE L

ART UNIT

PAPER NUMBER

1762

DATE MAILED: 09/20/2002

13

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/511,398

Applicant(s)

Okumura et al

Examiner

M.L. Padgett

Group Art Unit

1762

— The MAILING DATE of this communication appears on the cover sheet beneath the correspondence address —

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, such period shall, by default, expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

☒ Responsive to communication(s) filed on 6/19/02

☒ This action is **FINAL**.

- ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

- ☒ Claim(s) 2-5, 10-12, 15-17, 24-26 + 55 is/are pending in the application.
- Of the above claim(s) _____ is/are withdrawn from consideration.
- ☐ Claim(s) _____ is/are allowed.
- ☒ Claim(s) 2-5, 10-12, 15-17, 24-26 + 55 is/are rejected.
- ☐ Claim(s) _____ is/are objected to.
- ☐ Claim(s) _____ are subject to restriction or election requirement.

Application Papers

- ☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.
- ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.
- ☐ The specification is objected to by the Examiner.
- ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119 (a)-(d)

- ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119 (a)-(d).
- ☐ All ☐ Some* ☐ None of the:
- ☐ Certified copies of the priority documents have been received.
- ☐ Certified copies of the priority documents have been received in Application No. _____.
- ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

Attachment(s)

- ☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____
- ☒ Notice of Reference(s) Cited, PTO-892
- ☐ Notice of Draftsperson's Patent Drawing Review, PTO-948
- ☐ Interview Summary, PTO-413
- ☐ Notice of Informal Patent Application, PTO-152
- ☐ Other _____

Office Action Summary

1. ~~The substitute specification is approved and entered in the file for the original. It is~~
noted that the added material on page 42 of the marked up version is supported by the configurations in Figures 10 and 11, so it is not new matter.

2. Claims 10 and 24 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The requirement for both the plasma trap being in the window and for the upper surface including a metallic surface portion, when an antenna is used to supply H.F. power, appears to be New Matter, as no disclosure thereof was found in the original specification by the examiner, nor does applicant appear to cite such support. The closest teachings were found to be the first embodiment, Fig. 1A, which shows the trap in the counter electrode that is supplied by R.F., and insulated from a metallic surface portion, but a counter electrode is not a dielectric window nor does it use an antenna. Alternately, the seventh embodiment shown in Fig. 8, has the trap in the dielectric window 14 and uses an antenna, but does not meet the requirement of the metallic surface portion opposed to the substrate on the upper surface, since the dielectric window extends across the entire upper surface.

3. Claims 2-5, 10-12 and 55 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The problematical wording in claim 55, which is also in claim 5 that has been amended to be dependent on elected claim 2, has not been corrected. Again, "the plasma has a groove"...does not make sense. The examiner note that similar language in the original

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specification was amended to say --plasma trap-- which would make sense both in context of the claims and the apparent intent of the invention.

In line 5 of claim 2 (marked up version), "a dielectric windows provided on an upper surface..." (emphasis added) does not make sense, because if it was on the chamber's surface, it would not function very well as a window, and furthermore, it is inconsistent with claims 10-12. To be consistent with these dependent claims, as well as Figures 10-11 of the specification language such as --provided in...-- or --so as to form a portion of...-- would be appropriate (and analogous to claim 15).

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

5. Claims 2-10, 15-24 and 55 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Higuchi et al, in view of Chen et al (5,824,605).

Higuchi teaches a plasma apparatus and process using a coil (antenna) exemplified by Fig. 3 or 4 that are powered by RF frequencies of 1 MHz to 200 MHz, and may use a recessed dielectric window in the plasma apparatus vessel that maybe Al and grounded, as illustrated in Figures 9-14, with the exemplified depth at 5 cm. Particularly note Figures 9 and 10, where the later shows plasma distributions that indicate plasma in the gap, groove, etc., between the wall of the Al vessel and ref. No. 211 (side wall) of the window. This may be called trap, and may be considered to be between the sidewall of the chamber and the window, and outside the window, but does not have a metallic upper surface portion that is not part of the trap. Also, see the abstract; col. 8, lines 35-63, esp. 60; col. 16, line 12- col. 17, line 63 and col. 18, lines 57- col. 19, line 14. It is noted that in col. 16-17, the RF frequency employed is exemplified by "13.56-KHz", which would appear to be a typographical error, since it is outside the range of frequencies disclosed for use with the coils in general on col. 8, and as MHz is the unit that is typically employed with that numerical value. However, the specific example is not necessary to supply the useful frequencies, given the initially disclosed useful range of 1-200 MHz.

Higuchi et al also do not teach a window configuration where the recessed area can be said to be "in" the window, however Chen et al (Abstract; Figures 1-4; col. 4, line 65-col. 6, line 30, esp. col. 5, lines 1-2, 10-29 and 51-65; and col. 7, lines 14-25) illustrates an alternate analogous configuration of the dielectric window, (18a+b) for use with antenna, also used for adjusting the plasma distribution when treating substrates with coil/antenna induced plasma. As seen in Figures 2 and 4, the dielectric window does NOT extend all the way to the wall of chamber 12, but is screwed into or attached to structural material of the chamber (walls) that contain gas inlets, and that is variously shown having an upper surface that is out more than the

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indent in the window in Fig. 2 or also indented but less than that of the window's grooves in Fig.

4. ~~Chen et al does not discuss of what material their chamber walls are made, but it would have~~

been obvious from the analogous structure in Higuchi et al to make the walls metal, such as Al, as such is a standard construction for such plasma apparatus using antenna, to make them functional. It would have been further obvious to one of ordinary skill in the art that this alternate configuration of Chen et al would have been capable of producing analogous effects to that of Higuchi et al, and which versions are employed would have depended on configuration considerations involving other chamber features or the substrate shape, etc., especially as Chen et al indicates that other lower window configurations, such as one that omits the tapered outer wall (i.e., analogous to the configuration of Higuchi et al), are considered useful.

6. Claims 2-4, 11-12, 15-17 and 25-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bhardwaj et al, in view if Higuchi et al.

Bhardwaj et al use of annular dielectric windows and RF antenna coils for generating gas plasma, where various configurations of modules of the dielectric and coil constructions may be used in the apparatus as illustrated in Fig. 1. Note that the chamber is a metal container, and that the Figures 2 and 11 provide configurations that read on those described by applicant's claims, since the inset dielectric windows (21 and 20 in Fig. 2) form annular grooves, and the supporting structures and unnumbered walls in the figures may be conductive material, which is suggestive of metal like in the chamber walls. Note in Fig. 2, since there are 2 annular rings of dielectric material, the outer one reads on the placement of the trap in claims 11-12 and 25-26 as written. See the abstract; col. 2, line 65-col. 3, line 24 and line 52- col. 4, lines 10 and 60-67; and col. 6, lines 10-43. Note from Fig. 1, areas would have been expected to be as claimed, and while the size or width of the annular groove would have been depended on the overall apparatus and substrate sizes, since semiconductor wafers are proposed for treatment,

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so that 6 to 8 inch diameter substrates may be effected, the grooves as shown in Figures 2 or 11, would have been expected to be within the claimed 3-50 mm range for such dimensions.

Also, while Bhardwaj et al do not specifically discuss vacuum, it appears to be understood from context of the plasma.

Bhardwaj et al do not teach any particular range of frequencies for their application of RF to the antennas, however Higuchi et al (discussed above) provides ranges of 1-200 MHz as being useful in analogous plasma apparatus, hence one of ordinary skill in the art would have expected such frequencies to be effective in Bhardwaj et al. Higuchi et al further provide the specifics for the expected or obvious vacuum system for the plasma chamber and provide for more discussion on the metals, such as A1, used in chamber walls.

7. Claims 2, 10, 15 and 24 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Tomoyasu.

Claims 3-5, 16-17 and 55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tomoyasu.

In Tomoyasu, see the abstract; Figures 11-15; col. 9, lines 3-39, esp. 20-24; col. 12, line 20- col. 14, line 24; esp. col. 12, lines 20-52 and col. 13, lines 10-20 and 45-59, particularly noting that Fig. 14 provides an alternative antenna arrangement for use in the apparatus of Fig. 11. The barrier and baffle structures (116, 118) are arranged in "concentric fashion", i.e. implying annular, and made of insulating (i.e., dielectric material), and part of RF transmitting window 114. The process chamber 4 is grounded, hence must be conductive and has an upper surface portion as claimed, with col. 5, lines 53-56 indicating Al used for the chamber. Note the horizontal segments of the chamber wall, read on the requisite metallic upper surface portions, and either or both of spaces 120 (the two outer most grooves formed by the baffles and

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barriers). The phrasing concentric fashion is noted to be synonymous with annular for these outer two, i.e. non-central spaces.

While RF is said to be supplied to the antennas used on the upper surface, no range of values is given at the discussion of Figures 11-15, however col. 9, lines 20-24 provides the range of 10 MHz – 100 MHz for application to the analogously placed upper electrode of Figures 1, 4, etc., so that appears to be the range of frequencies used by Tomoyasu et al to supply their main plasma initiators. Alternately, it would have been obvious to one of ordinary skill, that since no specific values are given for the RF supplied to the antennas of Figures 11-15, that the frequencies supplied to analogously placed electrodes above windows in previous embodiments would have been expected to be effectively employed.

While dimensions are not discussed for Fig. 14, the use for treating wafers and dimension employed for the alternative configuration of Fig. 11 (col. 13, lines 18-20), would have been expected to employ values on the order of those claimed.

8. Claims 2-5, 10, 15-17, 24 and 55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tomoyasu in view of Higuchi et al.

Alternatively, as discussed above the analogous process of Higuchi et al, which employs antenna and widows, provides for the use of 1-200 MHz frequencies, hence substantiates the above assertion that the taught 10-100 MHz in Tomaysua was also intended or obvious to use in the antenna embodiments.

9. The two Okumura et al references are made of record, and it is noted that the claims of USPN 6,346,915 B1 are very close to the present claims for the structure of the plasma trap, since the conductor range claimed therein reads on the upper metallic surface of the present claims. However, the antenna and the hole through a dielectric plate in all the patent claims, appear to require a structure not in the application claims.

10. Applicant's arguments filed June 19, 2002 and discussed above have been fully considered but they are not persuasive.

11. Applicant's arguments with respect to claims 2-5, 10-12, 15-17, 24-26 and 55 have been considered but are moot in view of the new ground(s) of rejection.

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

13. Any inquiry concerning this communication from the examiner should be directed to M. L. Padgett whose telephone number is (703) 308-2336. The examiner can generally be reached on Monday-Friday from about 8 a.m. to 4:30 p.m. and fax (703) 872-9310 (regular); (703) 872-9311 (after final) and (703) 305-6078 (unofficial).

M.L. Padgett/dh
September 20, 2002
September 20, 2002


MARIANNE PADGETT
PRIMARY EXAMINER